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Message
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From: Phil Rapoport ███ @ripple.com]
on behalf of Phil Rapoport ███ @ripple.com> ███ @ripple.com]
Sent: 10/17/2013 8:49:09 AM
To: Chris Larsen [Chris Larsen < ███ @ripple.com>]
Subject: Ripple Primer
Attachments: Ripple_Primer.pdf

I stole a lot of the language from existing content, but I tried to synthesize it in a "research report" style that wall street is accustomed to.

Ripple BD/Sales Material/White Papers/Ripple Primer/

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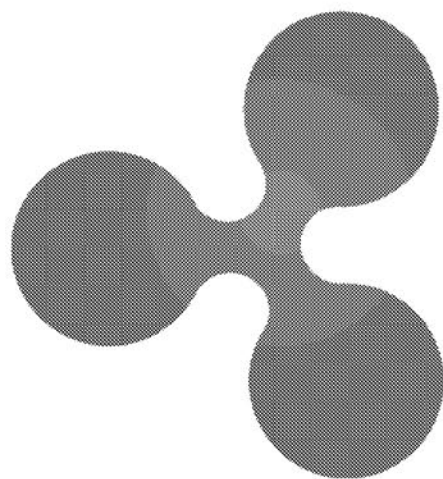
Ripple: A Primer

Contents

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Ripple: Executive Summary

What is Ripple?

Ripple is an Internet protocol for making financial transactions. You can use Ripple to send money anywhere in the world, in any currency, instantly and for free.

What is an Internet protocol?

An Internet protocol is a set of rules followed by the computers on the Internet to help them communicate with each other.

Examples of Internet Protocols

The protocol HTTP (Hypertext Transfer Protocol) is a set of rules for building and sharing websites. The invention of HTTP led to the World Wide Web.

The protocol SMTP (Simple Mail Transfer Protocol) is a set of rules for sending messages on the Internet. The invention of SMTP made it possible to send emails.

The protocol RTXP (Ripple Transaction Protocol) is a set of rules for making transactions on the Internet. The invention of RTXP makes it possible to transfer value across a distributed network. Like email for money!

Who owns Internet protocols?

No one owns a protocol. It is invented to be a useful standard. Anyone can choose to use a protocol in his software or business. Ripple is free and open source. Just like email, no one owns it, and there is no central operator.

What are the advantages of using Ripple for financial transactions?

An open, shared Internet protocol for financial transactions offers many advantages.

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Payments are cheaper. Because Ripple is not owned by anyone, the cost of making payments decreases. Merchants that receive payments via Ripple can save billions of dollars in fees.

Payments are faster. Because Ripple transactions are automatic, payments can be fully settled within seconds. By making money available sooner, Ripple can accelerate economic activity.

Currency exchange is easy. Ripple makes it possible to exchange currencies at no extra charge. This makes international commerce easier and more profitable.

Finance is accessible. Because Ripple only requires an Internet connection, it can provide financial services to billions of people in under-banked areas of the world.

Finance is interconnected. By creating a shared protocol for money, Ripple makes transactions between independent businesses easy. This reduces friction and inefficiency in the financial system.

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Ripple: A Primer

## Payments Technology is Decades behind Communications

In the early days of the Internet, people could only send messages within a limited, closed network. If you were a CompuServe user prior to 1989, you could only send email to other CompuServe users. If you were a GEnie user, you could only send messages to other GEnie users. Email had not been created yet; there was no standard protocol to connect the messaging systems operated by each internet service provider.
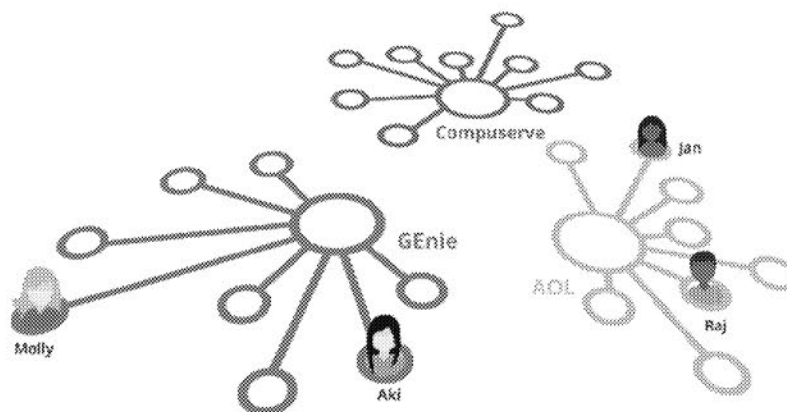
Early email providers operated as walled gardens

When SMTP (Simple Mail Transfer Protocol) was created, commonly known as email, it allowed the many disparate message systems to align into a single, interconnected system. The genius of SMTP was to connect independent systems — exactly what the Internet was designed to do. The advantages of a federated email system were so obvious and powerful that SMTP quickly became the standard for email. Today the idea of email without federation seems absurd.

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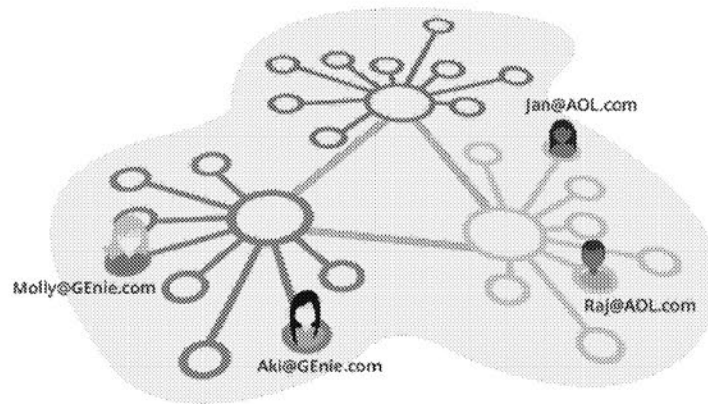
SMTP allows Molly@GEnie.com to message Jane@AOL.com

Today's payment systems look a lot like email did in the 1980s – closed and disconnected.

If you are a Wells Fargo customer, you can only make easy, free transfers to other Wells Fargo customers. If you have an American Express you can only buy things from businesses that accept American Express.

In order to link the disconnected payment systems, we add even more clearing houses. How do you send money from the Wells Fargo network to the Chase or Paypal network? You might use SWIFT (i.e. send a wire transfer), which adds another third party and another layer of fees to the transaction.
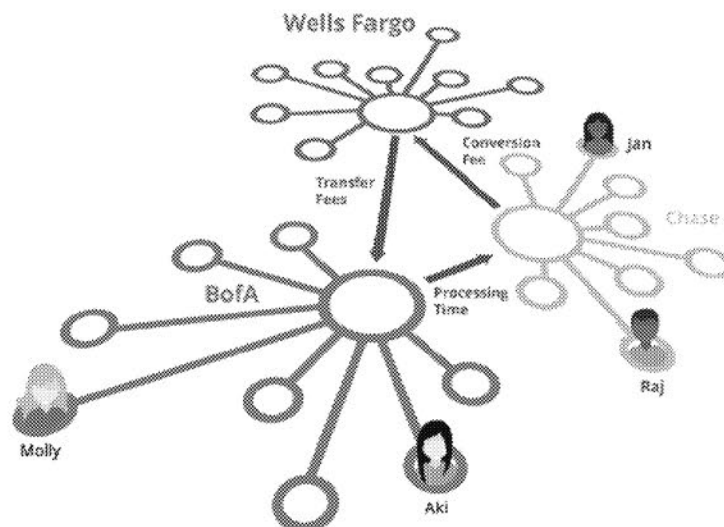
Finance today is like early email

When most information transfer has become free, there is still tremendous friction around value transfer. It still costs $15 to send a wire transfer. Remittance fees average around 7%. Credit cards charge ~2% on every transaction that occurs on the internet. Amazon.com is spending billions a year in payment processing fees.

Forty years into the internet, a big gap has formed between communications and finance. Communications have been flattened out by peer-to-peer, distributed networks. Yet the centralized nature of clearing and settling transactions has kept finance running on infrastructure that was mostly designed in the 1950s – 1970s, before the internet.

Money, in the digital era, is really just another type of information. It is information about credits and debits stored on digital ledgers. Why is there such a big disconnect between how computers transmit money versus how they transmit other information?

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Centralized   Decentralized   Distributed
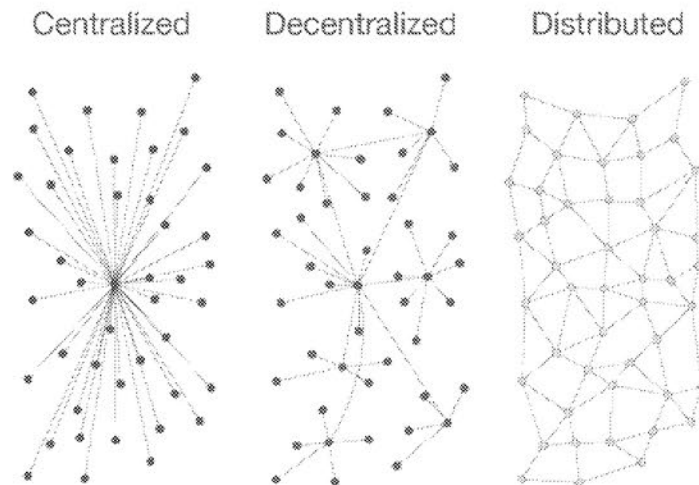
Source: p2pfoundation.net

Information exchange occurs on distributed networks;
*Payments remain predominantly on centralized networks.*

Sending money is slow, expensive, and complicated because there are so many independent networks and payment systems running on centralized and proprietary software. Centralized networks are expensive – they require fees to pay for staff and servers and to turn a profit.

Ripple: Distributed Clearing and Settlement

Ripple is a universal protocol for money that allows independent payment systems to communicate as easily as email systems do. **Just as SMTP created a shared standard for email, Ripple creates a shared standard for payments.** As with email, no one owns Ripple, and there is no central operator. Ripple is open source software that allows servers all over the world to communicate peer-to-peer financial transactions to one another.

If the Ripple protocol becomes the standard protocol for money, payments will become as fast, cheap, and easy as email. There are no network fees, and payments are instant.

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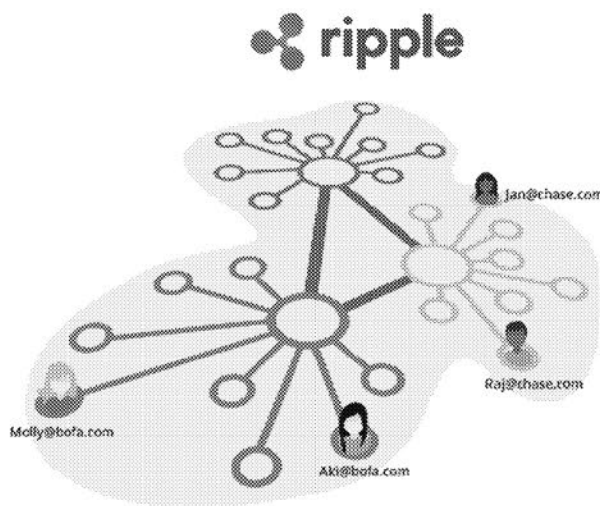
Ripple is a Federated Payment System

Ripple: How It Works

The Ripple network, at its core, is a shared, public database. Within the database is a ledger that tracks accounts and balances. At any time, anyone can view the ledger and see a record of all activity on the Ripple network.

The Ledger

Computers on the network mutually agree on changes to the ledger through a process called consensus. **The network reaches consensus globally within seconds.** This consensus finding process is the engineering breakthrough that allows for fast, secure, and decentralized transaction settlement on the Ripple network.
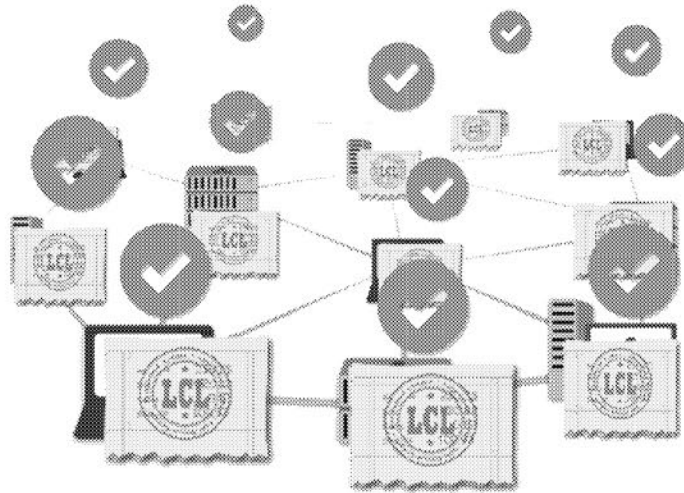
Computers on the network reach consensus about changes to the ledger.

Distributed networks offer many efficiencies over centralized networks. Because the network is "self clearing," it eliminates the need for a centralized network operator (and gets rid of the associated layer of fees). Because there is no single point of failure, distributed networks are more reliable. And because they are open source, they tend to be more secure.

A Universal Translator: the World's First Distributed Exchange

Ripple supports any currency. But it goes farther than that: Ripple gives users complete currency choice. You can hold balances in one currency and send payments in another.

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You can hold your balances on Ripple in USD and pay a merchant in JPY, EUR, bitcoin, gold, or any other currency. The Ripple network "translates" currencies by routing orders through market makers who compete to earn bid/ask spread.

In the diagram below, a user who holds USD balances sends payment to a merchant who only accepts payment in JPY. A market maker facilitates the transaction, buying USD and selling JPY.
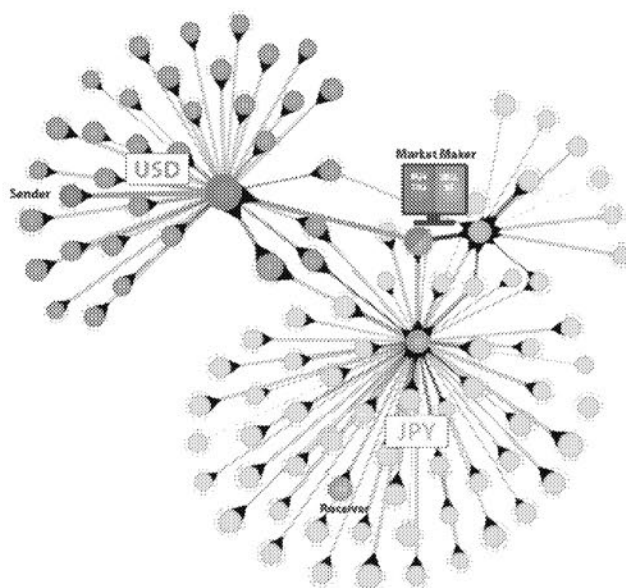
A user with USD balances pays a merchant in JPY.
The Market Maker buys USD and sells JPY to facilitate the transaction.

Ripple's distributed exchange allows users to trade without the need for a broker or a third party exchange. Anyone can post bids or offers into aggregated global order books, and the Ripple network finds the most efficient path to match trades. There is no network fee, and there is no minimum size.

For decades, economists have debated the merits of creating a global currency. Nobel Laureate Friedrich Hayek once hoped that technology would arise to make a multiple-currency model more efficient: "Electronic calculators, which in seconds

would give the equivalent of any price in any currency at the current rate, would soon be used everywhere," he wrote.

Ripple's distributed exchange is the "electronic calculator" that Hayek dreamed of, but on a scale he probably never imagined. Ripple is the world's first universal translator for money.

Now every currency has the smooth transactional qualities of a global currency. You can hold balances in gold or bitcoin and easily send payments in dollars or Euros. Ripple gives everyone complete currency choice.

Digital Money, Counterparty Risk, and Ripple Gateways

Traditional fiat currencies – when in digital form – have counterparty risk associated with them. This may not seem obvious at first glance, but in order to get your fiat $100 bill onto a digital network, you would traditionally hand it over to the network operator: your bank or Paypal, for example. In return you get an IOU showing your account balance.

At that point, you no longer hold fiat money. You traded fiat dollars for a digital USD balance which is effectively just a promise to pay. It is a promise from the bank that you can redeem your money on demand. And as the last few years have demonstrated, USD deposits at Citibank are not necessarily equivalent to USD deposits at Bank of Cyprus or Bank of Iceland. Hence digital fiat currencies have counterparty risk.

This holds true within the Ripple network as well. USD balances traded within the Ripple network are redeemable at a specific "gateway". A gateway is where fiat money enters and exits the Ripple network.

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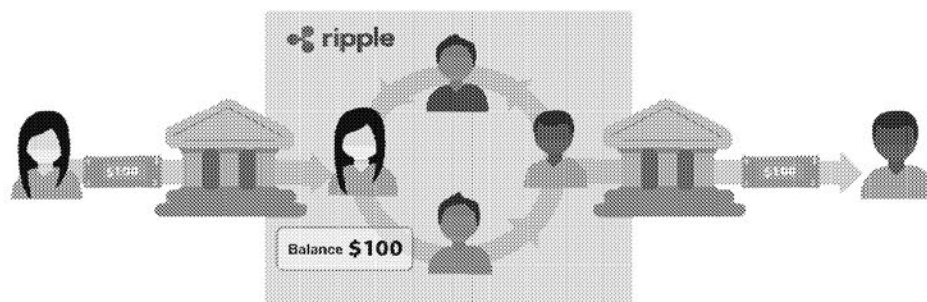
Fiat money enters and exits the Ripple network at a "gateway".

In practice, gateways could look very similar to traditional banks; but a gateway can be any business that provides access to the Ripple network. Gateways can be banks, money service businesses, marketplaces, or any financial institution. Businesses that become gateways create advanced financial functionality for their customers and generate new revenue streams.

Just as with any form of digital fiat currency, it is critical that you trust a gateway's ability to redeem your balances on the Ripple network as well.

Math Based Currencies

A math based currency, also referred to as a cryptocurrency, is a digital asset with verifiable mathematical properties, similar to how we can reliably verify gold as an atom with 79 protons. Math based currencies exist as digital assets in their own right and can be transferred directly between users (as fiat cash could be) without relying on any centralized network operator.

The supply of a math based currency is governed by the laws of mathematics. There is no human intervention beyond the creation of the protocol rules. This is in contrast to the many "virtual currencies" that can be issued without restriction by companies and people (airline miles, reward points, Facebook credits, etc.)

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Bitcoin was the first example of a math based currency. Bitcoin exists natively as a digital asset. It is not a balance that is redeemable somewhere, and it does not have risk to any counterparty like the "digital fiat" currencies described above. You could hand someone a thumb drive with bitcoin on it, and in doing so, you are transferring the asset itself, like handing over cash, as opposed to transferring an IOU or someone's promise to pay. It does not require trust in any third party.

There is a math based currency called XRP (prounced "ripples") that is native to the Ripple network. Just like bitcoin on the Blockchain, XRP exists natively within the Ripple network as a counterparty-free currency. Because XRP is an asset as opposed to a redeemable balance, it does not require that users trust any specific financial institution to trade or exchange it.
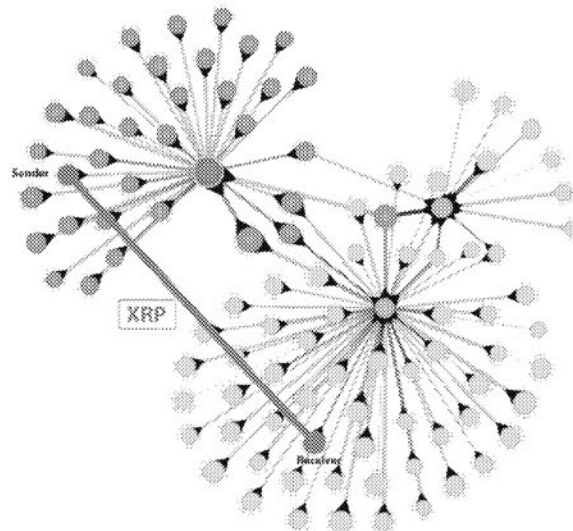
Transactions without counterparty risk

Users of the Ripple network are not required to use XRP as a medium of exchange or as a store of value. The Ripple network is currency agnostic. Users can use their favorite currency, whether that's USD, BTC, XRP, or something entirely different.

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XRP exists to fulfill two primary network functions – network security and to act as a currency bridge – which we will discuss below.

XRP: Protecting the Network from Abuse

Since the Ripple network is based around a shared ledger of accounts, a malicious attacker could create large amounts of "ledger spam" (i.e. fake accounts) and transaction spam (i.e. fake transactions) in an attempt to overload the network. This could cause the size of the ledger to become unmanageable and interfere with the network's ability to quickly settle legitimate transactions.

To protect the network from abusive creation of excess ledger entries, each Ripple account is required to have a small reserve of XRP to create ledger entries. This reserve requirement is currently 50 XRP, which is roughly equivalent to $0.50 at time of writing. This requirement is intended to be a negligible amount for normal users while preventing a potential attacker from amassing a large number of fraudulent accounts to "spam" the network.

With each transaction that is processed, 0.00001 XRP is destroyed (roughly one one-hundred-thousandth of a penny in USD terms). This is not a fee that is collected by anyone – the XRP is destroyed and ceases to exist. This transaction fee is also designed to be negligible for users. But when the network is under heavy load, such as when it is attacked, this fee rapidly rises.

The goal of this design is to quickly bankrupt attackers and keep the network functioning smoothly. Attacking the Ripple network can get very expensive, very quickly, but for regular users, the cost effectively remains "free".

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XRP: A Bridge Currency

XRP can also be very useful as a bridge currency. If two counterparties cannot find a shared currency/gateway combination, XRP can fill in as a neutral currency with no counterparty risk. For example, Alice prefers USD and Bob prefers EUR. If they cannot find a suitable EUR/USD market maker to resolve their transaction, they may find it advantageous to convert their preferred currency to and from XRP to be able to transact with each other.

In the diagram below, we show how in some instances, converting to/from XRP could result in less transactional friction. XRP is not a required bridge currency, only a useful one.


XRP as a Bridge Currency
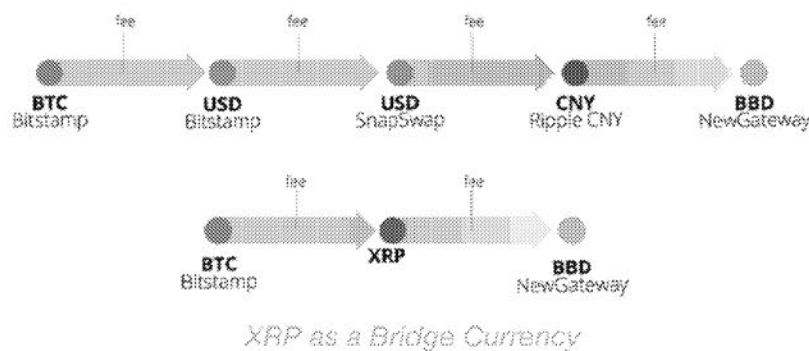
Three factors make XRP an ideal bridge currency on the Ripple network:

* XRP has low friction. It can be sent directly to any account with no transfer fees
* XRP has no counter party risk. It is the only currency native to the Ripple network and thus requires no trust relationship with any gateway or third party.
* XRP cannot be debased – a finite amount exists. 100 billion XRP was "minted" with the creation of the protocol, and by definition, no more will ever be created.

There is no requirement that Ripple users hold or exchange XRP, aside from the negligible reserve amount. Ripple is currency agnostic. Merchants do not need to

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accept XRP to use Ripple. Both buyers and sellers can continue to use their preferred currencies.
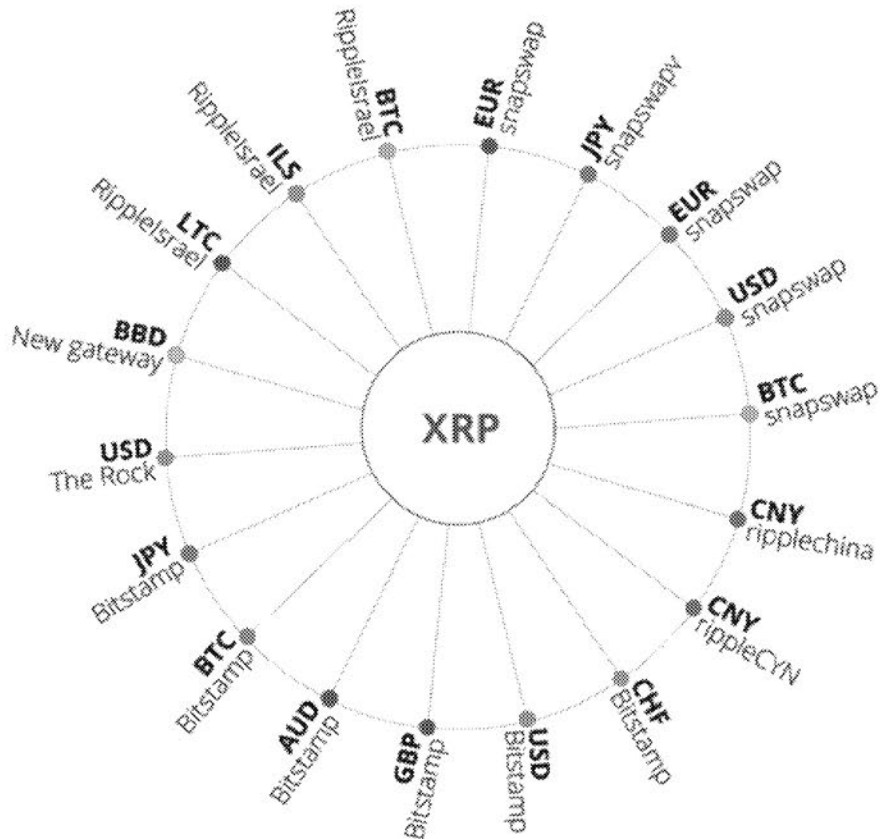
About: Ripple Labs Inc.

Ripple Labs is the creator of Ripple. We developed the protocol and its distributed payment network, and we now work to support and promote its growth. Because Ripple is free and open source, we receive no cash flows from the network.

Ripple Labs hopes to make money from XRP if the world finds the Ripple network useful and broadly adopts the protocol.

100 billion XRP was created with the Ripple protocol. Ripple Labs plans to gift 55 billion XRP to charitable organizations, users, and strategic partners in the ecosystem over time. The company will retain a portion with the hope of creating a robust and liquid marketplace in order to monetize its only asset sometime in the future.

If the Ripple network grows into a vibrant, distributed payment network, Ripple Labs will have accomplished its goal, and the Ripple protocol will belong to the community as a free and open source resource.

Partner With Ripple

The Ripple protocol is in its infancy. This primer only scratches the surface of its robust potential. At Ripple Labs, we are working on many exciting new applications, and the utility of the Ripple network will only grow.

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We believe that distributed financial networks and math based currencies will revolutionize the infrastructure of our financial system in the near future. We invite anyone who shares our view to get in touch so that we can work together.

The Ripple ecosystem needs gateways, market makers, developers, and merchants to fulfill its potential.

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